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STUDIES IN THE DRIFTLESS REGION OF WISCONSIN

In my previous articles under the above title I have stated that no glaciated material had up to that time been found. Indeed I was not very hopeful that any would be found, for not only are the beds concealed to a very large extent, but the parts exposed are those which would naturally be composed of superglacial and englacial material. Add to this the fact that the glaciers if really prescribed, were but a few thousand feet long at the utmost, and the further fact that even of this short distance a considerable portion was over loess of earlier deposition and it will be seen that such material must necessarily be scanty. Nevertheless in view of the extreme difficulty of determining the original aspect of the beds in many important particulars it was very desirable that the evidence which could be furnished by glaciated material should be added to that already given. I think it very fortunate therefore that during the past summer I have discovered a bowlder which gives very strong if not decisive indications of glacial abrasion, and inasmuch as it will form a most important part of the evidence for the existence of glaciers I will describe it in considerable detail.

The bowlder lies at the bottom of a ravine, well within one of the smaller valleys. It is about 10 in.×14 in.×26 in. in dimensions. The material is a rather hard, course-grained ferruginous sandstone, such as occurs a little below the base of the Lower Magnesian limestone. Its rather rough uneven surface is the product of prolonged weathering, but at one end there is a facet forming an irregular oval about 6 in.×8 in. which contrasts strongly with the rest, being nearly flat, and very noticeably smoother to the touch. Examination with a lens shows that this smoothness is due to the relatively small projection of the individual sand grains, few standing out more than a third of their diameter above the general surface, while on the weathered portions they often project nearly their entire diameters.

It is evident that the resistance of the sand grains to abrasion was greater than the strength of the cementation, so that the abrading agent removed them integrally instead of wearing them down to a common surface. There is, however, near one edge of the facet a small concretionary nodule within which the great abundance of iron furnishes a strong cement. In this the individual grains *are* worn to a common surface, the effect being equal to the best examples of glacial polish. A portion of this concretion passes over onto the weathered surface where the grains are all entire, and owing to the strong cementation many of them are held as the capping of little pedicels, giving a very rough surface. The bedding plane of the bowlder is parallel to its longer diameters, and the flattened facet is nearly perpendicular to this. The facet is crossed in a direction perpendicular to the bedding plane by a straight groove about ¼ in. wide and deep enough to render it perfectly distinct. Other markings are but faintly shown, but so far as they are distinguishable they are parallel to the groove.

It appears quite evident that this abraded facet was superimposed on an originally weathered surface, for sundry depressions occurring within it were not affected by the abrasion, but still retain their original weathered character. Taking all these features into consideration I think it may be said that they are such as are characteristic of glacial abrasion, while it is hard to suggest another agent by which they could have been produced. Certainly none which we have the least reason to believe was operative in the locality.[1]

I have mentioned that the bowlder lies at the bottom of a ravine. It may therefore be well to add that although it is exposed to the action of the occasional torrents, yet the facet in question is turned away from them, while that portion which does receive their impact (and has certainly for a long time) is indistinguishable from the rest of the weathered surface. But the results of torrential abrasion are so different from those described that it need not be seriously considered as a possible agent.

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[1] It would seem that abrasion of this kind and extent might be within the competency of the friction to which ordinary talus is liable to be subjected in descending a slope.—Ed.

If this be a case of glacial abrasion, and it is difficult to resist such a conclusion, it must necessarily decide the question as to the existence of small local glaciers, since its situation is such that if glaciated at all it was certainly the work of such local glaciers.

It was my hope during the season just passed to make a series of observations at critical points with a view to a more definite determination of certain doubtful features, but owing to a pressure of other work they were for the most part left incomplete. On two points, however, evidence of considerable value was obtained. The first relates to the frontal characteristics of the bowlder beds, especially the frontal slope. This appears to have been normally steep as compared with the portion immediately back of it along the axis of a valley.

This characteristic is shown in two or three of the beds which fail to reach the present river level, but as they fall within the limits of the highest terrace it is open to question whether the effect was not due to erosion when the river was at that stage. But I have ascertained that the same characteristic is found in beds which terminate a hundred feet or more above this level. Still another bed extends to the present river level and has been truncated by river erosion, but gives no indication of erosion at the higher level, although by situation it was especially exposed to erosive action — far more so than the other beds which were well protected from currents.

The second relates to the disposition of the beds along the sides of the valleys showing that on reaching their rocky sides the beds rise to higher level than along the axes of the valleys, This is not hillside wash since the material is foreign to the hills on the sides of which it occurs.

Assuming these beds to be glacial an interesting question is raised as to their synchronism with the successive phases or epochs of the glacial period.

Before this can be answered other than conjecturally it will be necessary to correlate them with the succession of non-glacial deposits filling the larger valleys of the driftless region, a work of considerable difficulty.

G. H. Squier.